ORIGINAL ARTICLE

Waiting and interaction times for patients in a developing country accident and emergency department

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Objective: To determine the interaction and waiting times of patients in Barbados Queen Elizabeth Hospital Accident and Emergency Department (A&E), identify their determinants, and compare them to international benchmarks.

Methods: Trained research assistants monitored all patients attending A&E during a one week period in 2003. The time in and out of each step in the process of care was recorded along with demographic data, diagnosis, and acuity. Time elapsed was calculated for various steps in care and compared to international benchmarks. Determinants of timely care were identified.

Results: Of 882 eligible A&E patients, 675 (77%) had accurate data and were entered into the study. Interaction times were short, with median total interaction time 13 (IQR 9–21) minutes. Waiting times were long ranging from median 6.5 (IQR 2–22) minutes for registration to 213 (IQR 154–316) minutes for lab results. Of concern was a median wait of 10 (IQR 2–46) minutes for triage and 178 (IQR 105–305) minutes to be seen by a doctor. Mean total length of stay was 377 (SD 261) minutes compared to US benchmark of 90 minutes. All other waiting times were at least twice US benchmarks. Paediatrics cases and children aged 0–11 years had the shortest waiting times and length of stay, whereas medicine patients and those over 49 years had the longest. Those with highest acuity had the shortest waiting times and length of stay.

Conclusions: The A&E could improve patient care processes by shortening waiting times, especially for laboratory results, triage, and seeing a doctor, particularly for older medicine patients.

The Institute of Medicine's Committee on Quality of Healthcare in America 2001 report recommends that health care should be delivered by systems that are designed to provide care that is safe, effective, patient centred, timely, efficient, and equitable.[1] Thus, to be considered quality care, care delivery must be timely. This is particularly true in the emergency department (ED). Numerous ED patient surveys have shown that timeliness is a very important contributor to patient satisfaction.[2–13] As patient satisfaction in the ambulatory setting is correlated with other important outcomes, including higher compliance, decreased utilisation of medical services, and less malpractice litigation,[1 14] achieving timely delivery of service in the ED has significant implications for population health.

Timeliness of care, as measured by time studies, has been studied in many healthcare settings, including ED settings.[15–20] In order to determine acceptable waiting times, international benchmarks are consulted. For ED services, benchmarks used are those developed in the US[13 21 22]—the only published ones available. They were developed at a cross section of district, teaching, and tertiary hospitals, during 1997–2000.

Barbados is a moderately developed island nation of 275 000 people located in the Eastern Caribbean. The Queen Elizabeth Hospital (QEH), the only state funded acute care facility on the island, is a 600 bed university affiliated hospital located in Barbados' urban core. The Accident and Emergency (A&E) department of QEH has 45 000 patient visits per year. Facilities include 11 acute treatment beds (including two for resuscitation and one for paediatrics), a general holding/observation area with three beds, a two bed long stay area, and a dedicated area for treatment of up to nine asthmatic patients. Usually three doctors, one fully trained and two postgraduate trainees, staff the facility each shift (absentees may reduce this). A patient survey has documented patient dissatisfaction with waiting times in A&E.[23]

The goal of this study was to determine the time spent by patients in the QEH A&E in and between interactions, compare them to international benchmarks for timely care, and identify the determinants of timely care in order to make proposals for change that might improve the timeliness and hence the quality of health care delivered.

METHODS

Ethical approval for the study was obtained from the Institutional Review Board of the University of the West Indies.

A time sheet data collection instrument was developed based on the patient flow through the A&E. Six research assistants (RA) were trained in the study methods and maintenance of patient confidentiality.

A 24 hour pilot study was conducted starting at 0800 on a day chosen randomly from the month of June 2003. The RAs initiated a time sheet for every patient that came into the A&E. Demographic data and triage category were obtained from the patient chart. Triage categories were assigned by a nurse: category 1—patients who must be seen immediately; category 2A—patients who can wait up to 30 minutes to be seen (suspicious headache, chest pain, open fractures, etc); category 2B—patients who can wait up to six hours (diabetes, abdominal pain, serious lacerations); category 3—patients who may be seen elsewhere (uncomplicated urinary tract infection, gastroenteritis, minor lacerations). The time of arrival to A&E was noted and subsequently, throughout the patient's movement through A&E, the ''time

Abbreviations: A&E, accident and emergency; ED, emergency department; LOS, length of stay; LWT, left without treatment; QEH, Queen Elizabeth Hospital; RA, research assistant; TAT, turn around time

in'' and ''time out'' at every step was noted and entered by the RA. Personnel working in A&E were informed of the study and the fact that all data concerning both the patient and the caregivers were anonymous. Neither the patients nor the staff were involved in the data collection process.

When the pilot ended, the data pertaining to those patients whose visit was still incomplete were discarded. Because over 95% of the sheets produced were correctly completed and no data errors were detected, it was decided to proceed with the actual study without changing the methodology. A full week of data was collected by starting at 0800 on a randomly selected Thursday morning in November 2003 and ending at 0800 on the subsequent Wednesday morning and adding the data from the pilot study (which was a Wednesday).

The interaction time at each station and the wait time between each station was determined and the following variables calculated: length of stay (LOS)—time from arrival to final disposition: discharged, admitted, or left without treatment (LWT) (defined as leaving before being brought into a cubicle); total interaction time (the time the patient was under care and treatment); total waiting time; for patients who were referred, waiting time between referral and being seen by specialist.

Using Statistical Package for the Social Sciences (SPSS version 11 for Windows), the various times were tested for normality of distribution. Since distributions were not normal, non-parametric tests (Mann Whitney U test for binary variables and the Kruskal-Wallis test for variables with multiple choices) were used to compare the median times of various groups within the population ($p<0.05$ was considered significant).

Hospital data on A&E visits for the year 2003 were obtained for comparison with the study week.

RESULTS

Of 882 eligible patients, 743 (84.2%) had data collected. Of these, 68 (9.2%) were discarded because of data errors and 675 (76.5% of those eligible) were used for the analysis although not all had complete data. When the study week was compared to an average week in 2003, a significantly higher proportion of asthmatics and category 1 patients (28% *v* 24% and 32% *v* 28%, respectively, $p = 0.04$ for both) were seen. (Asthmatic patients are triaged as category 1 in A&E.)

The characteristics of study patients are given in table 1. Most (68%) of the patients came to A&E between the hours of 9 am–9 pm. About 10% of the daily census of patients arrived during the night (midnight–6 am).

The time required for the various patient interactions and the waiting times between those interactions are listed in table 2.

Non-parametric analysis of associations between several important times and patient characteristics are seen in table 3.

There were no statistically significant associations between any of the waiting times and gender. In general, more acutely ill, younger, paediatric patients had lower median waiting times to reach a cubicle and to be admitted resulting in shorter LOS. However, these same patients waited as long or longer to be seen after they reached the cubicle.

There was significant association between interventions and patient LOS (table 4). When the relation between acuity and interventions was examined, category 2A patients were significantly more likely to have laboratory tests, *x* ray examination, and referrals than either category 1 or category 2B patients ($p<0.001$ for all).

Table 1 Characteristics of study patients (n = 675)

Characteristic	Number	Proportion (%)
Age: 0–11 yrs	145	22.7
12–20 yrs	101	15.8
21–49 yrs	229	35.8
⩾50 yrs	164	25.7
Missing data	36	
Gender: Male	321	50.1
Female	319	49.9
Missing data	35	
Specialty: Medicine	264	42.1
Paediatrics	162	25.8
Orthopaedics	71	11.3
Surgery	70	11.2
O&G	31	4.9
EENT	29	4.6
Missing data	48	
Acuity: Emergency (1)	228	34.0
Urgent (2A)	400	59.6
Non-urgent (2B)	43	6.4
See elsewhere (3)	0	0
Missing data	4	
Had vitals done	568	84.1
Had laboratory test done	142	21.0
Had *x* ray done	133	19.7
Had CT scan done	24	3.6
Had referral to specialist	152	22.5
Seen by specialist	52	7.7
Admitted to hospital	111	16.4

CT, computed tomography; EENT, eye, ear, nose, and throat; O&G, obstetrics and gynaecology.

DISCUSSION

During the patient care process at A&E, the average patient waited for long periods of time for each interaction. However, the actual interaction times were short. Of the total median LOS of 302 minutes, 13 minutes (4.3%) was interaction time and the rest was waiting time. Only six minutes (2% of total visit time) was spent with the emergency physician—the core service the patient was seeking. The remaining seven minutes of patient interaction time was spent at registration, clerking, triage, and other such activity. These activities are unlikely to be considered valuable by the patient.

Comparing QEH A&E times to the international benchmarks (table 5) shows major scope for improvement. The only area where A&E performs better is in the registration process, which takes 1–2 minutes compared to up to 10 minutes in the US probably because only demographic and clinical information is solicited, not the detailed payment related data required in the US. The only other area where A&E performs close to current or worthy interim goal times is the *x* ray turn around time (TAT). All remaining times are at least twice as long as benchmark times.

Wuerz *et al*[24] have shown that triage assessment using a three level classification is usually inconsistent. Inefficient triage in the ED has been linked with prolonged waiting times and resultant patient dissatisfaction.[25] Therefore, if waiting times are to be reduced, safe and effective triage is mandatory.

The average patient in A&E waits a mean of 40 (median 10) minutes to be triaged. This is potentially dangerous and negates the basic tenet of triage. In addition, there were a large proportion of patients triaged in category 2A and no patients assigned to category 3, reducing the number of categories to 3. This may reflect inadequate triaging and could lead to a compromised level of care for those who are seriously ill. Clearly the triage process at A&E must be improved.

The youngest patients and those with paediatric diagnoses had the shortest wait to reach a cubicle, whereas those ⩾50 years old and those with surgical diagnoses waited the longest period of time. Since paediatric patients can be assigned to the same cubicles as adults, they are being given

Table 2 Descriptive statistics of various waiting and interaction times in minutes

	n	Mean	SD	Median	IQR	Minimum	Maximum
Interaction times							
Registration time	656	1.8	1.4	1.0	1–2	1	12
Triage time	618	1.7	1.4	1.0	1–2	1	17
Vitals time	675	1.8	1.9	1.0	1–2	1	28
Exam time by EP	609	7.6	4.4	6.0	5–10	1	36
Admission clerking time	94	6.1	2.8	5.0	4–8	1	18
Total clerking time	660	2.7	2.7	2.0	1–3	1	19
Total interaction time	675	13.8	67.9	13.0	9–21	1	532
Waiting times							
Wait for registration	662	18.4	29.8	6.5	2–21.5	0	239
Wait for triage	675	39.5	68.5	10.0	2–46	0	660
Wait for cubicle	582	92.5	139.0	30.0	2–131	0	780
Wait in cubicle	570	138.7	132.9	107.0	49–192	0	1140
Wait to see EP	622	234.1	192.2	178.0	105–305	0	1318
Wait for treatment	339	133.1	199.7	35.0	8–205	0	1299
Wait to 1st review	162	169.2	129.9	135.0	81–236	5	790
Wait for specialist	43	48.2	76.7	19.0	4–55	0	390
Wait for lab results	46	236.4	104.9	213.0	154–316	62	486
Wait for X-Ray results	86	75.8	77	52	28–94	8	413
Wait for CT results	16	92.3	48.1	76.0	52–121	39	210
Wait after admission	103	169.7	172.9	87.0	43–295	4	775
Wait after discharge	501	15.7	73.5	3.0	0–8	0	950
Total time in A&E (LOS)	657	377	261.3	302	180–545	2	1397

A&E, accident and emergency; CT, computed tomography; EP, emergency physician; IQR, interquartile range; LOS, length of stay; SD, standard deviation

preference by nursing staff selecting the next patient to be brought to a cubicle. The reasons for this need to be explored.

As expected, the most urgent cases (category 1) had the shortest wait for a cubicle, but, surprisingly, the category 2B patients were placed in a cubicle more quickly than the category 2A patients. The reasons for this need to be elucidated but may include incorrect triage.

Paediatrics and medicine patients and patients triaged to category 1 waited longest in the cubicle. Surgery and category 2B waited for the shortest duration in the cubicle. The latter is contrary to the expectation that seriously ill patients are seen quicker. Possible reasons include inconsistency of triage and the fact that some category 1 patients—for example, asthmatics, those needing oral rehydration, those in sickle cell crisis (mainly medicine and paediatrics patients)—are treated immediately on arrival by nurses following a protocol. The EP sees these patients only on completion of their treatment. Therefore, these patients wait longer to see the EP.

Patients who have been admitted prior to their laboratory and/or *x* ray results arriving in A&E would not have a laboratory and/or *x* ray TAT. This, along with missing data, accounts for the fact that most patients having these tests did not have TAT values. The mean laboratory TAT in the A&E of 236 minutes is far above the benchmark recommendation of 30 minutes and the typical laboratory TAT in the US of 60 minutes. Attention to reducing the TAT would significantly improve overall A&E LOS. *x* Ray TAT was much less than lab TAT and much closer to benchmark values. Hence, *x* ray TAT cannot be counted as a serious problem in A&E probably because there is a radiology suite in the A&E.

The shortest wait for admission was for paediatric patients and adults with obstetrics and gynaecology and eye, ear, nose, and throat diagnoses. All fell within what might be expected at a US hospital. Older adults and those with medical, surgical, and orthopaedic diagnoses waited for the longest periods probably because of a recognised shortage of

Table 3 Median times in minutes by specialty of diagnosis, age, and acuity

	Wait to cubicle median (IQR) n = 582	Wait in cubicle median (IQR) n = 570	Wait after admission median (IQR) n = 103	Total time in A&E (LOS) median (IQR) n = 657
Overall	30 (2–131)	107 (49–192)	87 (43–295)	303 (180–545)
Specialty of Diagnosis				
Medicine	18 (0–130)	130 (68–228)	155 (75–338)	394 (214–652)
Paediatrics	5 (0–29)	119 (77–187)	30 (10–52)	225 (141–340)
Surgery	100 (37–203)	76 (16–178)	122 (55–228)	345 (245–555)
O & G	79 (44–227)	82 (15–126)	40 (9–88)	395 (156–602)
Ortho	80 (20–232)	88 (25–200)	99 (48–214)	354 (230–593)
EENT	74 (26–170)	65 (16–97)	49 (17–49)	235 (104–353)
Age group				
0–11 yrs	5 (1–116)	110 (67–206)*	45 (15–63)	235 (150–348)
12–20 yrs	7 (0–92)	103 (44–180)*	30 (20–75)	244 (147–425)
21–49 yrs	45 (5–132)	106 (51–188)*	95 (33–294)	310 (202–585)
⩾50 yrs	60 (9–189)	103 (31–241)*	100 (60–325)	448 (280–675)
Acuity				
Emergency	1 (0–5)	141 (90–200)	55 (10–363)*	195 (141–279)
Urgent	87 (30–197)	92 (28–193)	95 (45–296)*	430 (265–642)
Non-urgent	60 (9–189)	103 (31–241)	100 (60–325)*	448 (280–675)

*No significant association found.
EENT, eye, ear, nose, and throat; IQR, interquartile range; LOS, length of stay; O&G, obstetrics and gynaecology; ortho, orthopaedics.
All associations $p<0.05$ by Kruskal-Wallis test unless indicated.

Table 4 Association between various procedures and total stay in A&E (LOS) (n = 657)

Intervention		n	Median (min)	Minimum (min)	Maximum (min)	IQR
IV access*	Yes	131	515	42	1397	340–662
	No	526	261	2	1274	162–455
Laboratory testing*	Yes	135	515	42	1397	347–654
	No	522	260	2	1274	161–446
x Ray*	Yes	130	389	70	1397	242–625
	No	527	283	2	1350	165–516
CT*	Yes	24	600	225	1274	438–890
	No	633	295	2	1397	175–525
Referral*	Yes	146	448	29	1397	282–638
	No	511	265	2	1274	163–485
Admission*	Yes	97	475	30	1350	287–638
	No	560	281	2	1397	166–494
Overall		657	302	2	1397	180–545

*$p<0.001$ by Mann-Whitney U test
CT, computed tomography; IQR, interquartile range; IV, intravenous; LOS, length of stay; min, minutes.

adult inpatient beds, especially monitored beds, to which many medicine patients are admitted. This leads to prolonged boarding of these patients in the department and increased congestion in the A&E.

A large variation in the waiting time after discharge was noted in this study and some were very long. Because the EP performs all discharge formalities, including discharge instructions, letters, and prescriptions, the discharged patient requiring this paperwork must wait until the EP is free to do it, contributing to congestion and LOS.

Younger patients were seen more quickly and had a shorter disposition time; thus, reducing their LOS. But the system seems to fail for older patients, who spend an inordinately long period in A&E. The main contributors to this longer LOS include waiting for specialist review, laboratory results, inpatient beds, or waiting after discharge.

The vast majority of category 1 and 2B patients had LOS $\leqslant$ median time. For category 1 cases, this is due to these patients being seen earlier and their disposition arrived at earlier (either because of the urgency of the case or because there was not any doubt about admissibility). The category 2B patients do not need extensive investigations as part of their A&E visit, which significantly reduces the LOS. In contrast, the longer LOS of category 2A patients is due to their need for more extensive investigative workup before disposition can be decided.

LIMITATIONS

A truly representative sample would have been obtained by randomly sampling days of the week taken over the entire year. However, analysis for one day at a time would necessarily have had to ignore patients at the end of each 24 hour block whose visit is not completed. This would introduce a significant bias against longer stay patients. A continuous study overcomes this problem but exposes the study sample to bias if unusual health conditions are affecting the population of Barbados at the time such as asthma. We conducted a one day study and combined it with a continuous six day study resulting in some of the disadvantages of both types—for example, the study week, when compared to an average week in 2003, was found to be non-representative because of an increased number of asthmatic patients visiting A&E. In addition, a number of patients were lost to the study because their visit was not complete at the end of one of the two study periods.

Table 5 Mean A&E waiting times compared to international benchmarks

	Mean A&E time (min)	Mean US time[21] or worthy goal[22] (min)	Recommended time (min)
Registration	1.8	>10[21]	5–10[21]
Wait to triage	39.5	–	0[24]
Wait to reach cubicle	92.5	15[22]	10[22]
Wait in cubicle	138.7	15[22]	10[22]
Door to EP	234.1	22[22]	14[22]
Wait before treatment	133.1	60[21]	20–30[21]
Lab TAT	236	60[21]	30–40[21]
x Ray TAT	75.8	60[21]	20–30[21]
Wait after admission	170	45[22]	24[22]
Wait after discharge	15.7	–	15[13]
Total LOS Admitted	486	240+[21]	120–240[21]
Discharged	357	150[21]	60–90[21]
Overall	377	115[22]	90[22]

A&E, accident and emergency; EP, emergency physician; LOS, length of stay; min, minutes; TAT, turn around time.

It was not possible to capture all the activity at all stations and, as a result, 24% of cases were lost. Patients who are most likely to be missed are those with extremely short or long stay in the A&E, leading to a non-representative sample.

The staff were aware of the ongoing study, hence it is likely that there may have been some enhanced performance (Hawthorne effect[26]).

The actual departure time of the LWT patients could not be captured. The time recorded was the time when the patient was called to come to a cubicle and found to have left A&E. The study reflects the actual time these patients would have waited if they had decided to stay in the department for treatment.

CONCLUSIONS

This study has shown that A&E is not meeting recommended benchmarks for timeliness in EDs or even the timeliness of US hospitals where studies have been done. A major portion of the patients' stay in A&E was due to the waiting times at various stages, particularly waiting for laboratory results, waiting to reach a cubicle, waiting in the cubicle to see the EP, and waiting in A&E after admission. All these waiting times have to be improved considerably to enhance the service provided by A&E.

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